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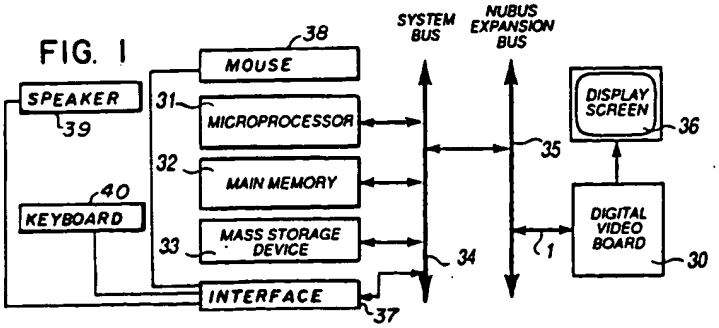
(54) Method and apparatus for video editing.

(57) A method and apparatus for video editing, in which video clips (and optionally also still image and audio clips) are stored as digital data in a computer memory, selected clips are displayed in elongated tracks on a display screen, and editing operations are performed on the clips in response to manipulation of displayed cursors and icons to assemble and preview an edited video program. Preferably, the inventive apparatus is a computer system programmed to display video, still image, and audio clips, and special effect icons, in tracks along a displayed time line. The system assembles a video program from stored clips in response to arrangement of displayed clips and special effect icons in a desired sequence along the time line. The computer system is preferably programmed to select a new in or out point for a clip by positioning a cursor at an edge of the displayed clip and dragging the edge relative to the time line, to select a special effect transition between displayed clips by positioning a transition icon in a special track in alignment with overlapping portions of the clips, to select special effect parameters by manipulating an icon in a special effects track, to filter selected video clips with a mosaic filter having user-selectable time-varying filter characteristics, and to control superimposition of an overlay clip with a main clip in response to manipulation of a level control icon displayed in alignment with the overlay clip.

FIG. 1



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speeds.

Summary of the Invention

The invention is a method and apparatus for video editing, in which video clips (and optionally also still image clips and audio clips) are stored as digital data in a computer memory, selected clips are displayed in elongated windows (known as "tracks") on a display screen, and editing operations are performed on the clips in response to manipulation of displayed cursors and icons to assemble and preview an edited video program.

The preferred embodiment of the inventive apparatus is a computer system programmed to display representations of video, still image, and audio clips at desired positions along a displayed time ruler, in tracks of a construction window. The system dynamically generates each video clip to be displayed by retrieving from storage all frames of the video clip (or every "Nth" frame of the stored clip in accordance with a user-selected time compression factor), and displaying the retrieved frames.

Animated "special effect" icons, each representing a special effect, are displayed in a separate special effects track also oriented parallel to the time ruler. Each special effect icon can represent a special effect transition between two clips (such as a dissolve, fade, and wipe).

The user instructs the computer to assemble a video program from the stored video clips (and optionally also stored audio clips and clips representing still image images or text) by arranging displayed clips and displayed special effect icons in a desired sequence along the time ruler.

In a preferred embodiment, the computer system of the invention is programmed to perform the following operations:

1. select a new "in" point, "out" point, or both, for a displayed clip (in the edited video program) in response to the positioning of a cursor at an edge of the displayed clip and manipulation of an input device to "drag" the edge along the time ruler;
2. select a special effect transition between a pair of video clips displayed in first and second parallel tracks (and having overlapping portions along the time ruler), by displaying a selected transition icon in a third parallel track in alignment with the overlapping portions of the video clips;
3. select special effect transition parameters (such as transition duration) by displaying a transition icon in a special effects track (where the special effects track is displayed below a first video track and above a second video track, and where overlapping video clips are displayed in the first and second video tracks), and positioning a cursor over the transition icon while manipulating an input device;
4. control superimposition of an overlay clip (representing video, still image, or text) with a main (video or still image) clip by displaying the clips in separate tracks, displaying a level control icon in alignment with the overlay clip, and manipulating the level control icon to display a graph representing a time-varying weighting function for combining the main and overlay clips;
5. preview a video program defined by clips displayed in a desired sequence along a time ruler of a construction window by retrieving the clips from memory, processing the retrieved clips (for example, in accordance with special effects transitions defined by transition icons displayed along the time ruler), and sequentially displaying the processed clips as a preview in a separate video window;
6. cache (in random access cache memory) all frames retrieved in response to a command to update a displayed window or to preview a program defined by clips displayed in a desired sequence along a time ruler of a construction window;
7. process one or more selected video clips by filtering the corresponding digital video data with a temporally varying mosaic filter (having user-selected time-varying filter characteristics); and
8. perform special effects processing by filling the alpha channel of a first clip with a first value (i.e., a hexadecimal "00"), filling the alpha channel of a second clip with a second value (i.e., a hexadecimal "1F"), performing a first special effect process in which selected pixels from the first clip are combined with selected pixels of the second clip to generate a processed clip, and processing alpha channel data of the processed clip to identify one or more edges of the processed clip (for example, to facilitate further special effect processing of the processed clip).

Brief Description of the Drawings

Figure 1 is a preferred embodiment of the inventive apparatus.

Figure 2 is a construction window displayed by a preferred embodiment of the inventive apparatus.

Figure 3 is a construction window (of the Fig. 2 type) with two video clips, one still image clip, one audio clip, and two special effect transition icons displayed in separate tracks thereof.

Figure 4 is a project window displayed by a preferred embodiment of the inventive apparatus.

When a user initiates an editing project, the system opens, and displays on monitor 36, a project window (such as that shown in Fig. 4 or Fig. 5) and a construction window (such as that shown in Fig. 2). By manipulating keyboard 40 and/or mouse 38, the user selects stored video clips (and optionally also still image clips and audio clips) from mass storage device 33. In response to selection of each clip, programmed microprocessor 31 generates an image ("thumbnail") for the clip, and displays the thumbnail (and corresponding identifying text) in the project window. Fig. 4 shows four such thumbnails 50, 52, 54, and 56 displayed in a project window. Fig. 4 also shows identifying text 51 for a video clip having thumbnail 50, identifying text 53 for a video clip having thumbnail 52 (and a corresponding audio clip having thumbnail 54), and identifying text 55 for a still image clip having thumbnail 56. The identifying text preferably includes the size in pixels (i.e., 320 pixels x 240 pixels) of each video or still image clip, and the clip duration (in the SMPTE format "hours:minutes:seconds:frames").

The thumbnail for a video clip can be one (possibly reduced) displayed frame thereof, such as thumbnail 50 and 52 in Fig. 4. For a still image clip, the thumbnail can be the corresponding image (or text), such as thumbnail 56 in Fig. 4. For an audio clip, the thumbnail can be a graph of a corresponding audio signal waveform, such as thumbnail 56 in Fig. 4.

Preferably, the system is programmed to enable a user to enlarge the project window by manipulating mouse 38 to position cursor 49 on size icon 57, and then dragging size icon 57 toward the right (on the screen of monitor 36). In response to enlargement of the project window, the system will display thumbnails representing additional frames of each previously selected video clip (each of which already has a thumbnail displayed in the project window). For example, Fig. 5 shows an enlarged version of the Fig. 4 project window, with three additional frames (50A, 50B, and 50C) of the video clip having thumbnail 50. In response to enlargement of the project window, the system will display, side-by-side, additional copies of the thumbnail of each still image clip. For example, in the enlarged project window of Fig. 5, four copies of still image clip thumbnail 56 are displayed.

Preferably, the user can control the time scale on which clips are displayed in the project window (i.e., the degree of time compression with which a video clip is displayed in the project window). This can be done by positioning cursor 49 on a "time unit" icon 58a in time compression window 58 and dragging icon 58a to a different station within window 58 (by manipulating mouse 38). Preferably, icon 58a can be positioned at any of several stations, each representing a different time scale (and time compression factor). Examples of such stations include: "single frame" (for displaying each frame of a video clip, i.e., one frame for each 1/30 second segment of a video clip representing video data having a frame rate of 30 per second), "two frames" (one displayed frame for each two frames of a video clip), "one second" (one displayed frame for each segment of a video clip having 1 second duration), and "two minutes" (one displayed frame for each segment of a video clip having 2 minute duration).

In general, the system responds to any command requiring display of a video clip in a window (which can be a preview window, or a construction window of the type to be described below) by retrieving from storage, caching, and displaying every "Nth" frame of the selected video clip. The factor "N" is determined by the currently selected time compression factor. For example, if the user has selected the above-described "one second" time compression factor, the factor N equals 30, and the system will display every 30th frame of a selected video clip (if the clip has a frame rate of 30 frames per second).

For another example, in response to selection of a stored video clip from mass storage device 33 for inclusion in a project (and display in the project window) with time unit icon 58a at a "single frame" station in time compression window 58, the system will display in the project window as many frames of the clip as will fit in the currently configured project window, and will cache all the displayed frames in cache memory 32. If the user then enlarges the project window, the system will retrieve a larger subset of the clip's frames from cache memory 32 (and mass storage memory 33), display this larger subset of frames in the enlarged project window, and cache the displayed frames in cache memory 32.

For another example, in response to selection of a stored video clip from mass storage device 33 for inclusion in a project with time unit icon 58a at a "two frames" station in window 58, the system will display in the project window as many frames of the time-compressed clip as will fit in the currently configured project window (i.e., only the first, third, and fifth frames, if only three frames will fit in the project window), and will cache the displayed frames in cache memory 32. If the user then enlarges the project window, the system will retrieve a larger subset of the time-compressed clip's frames from cache memory 32 (and mass storage memory 33), display this larger subset of frames in the enlarged project window, and cache the displayed frames in cache memory 32.

To generate an edited video program, the user drags thumbnails of selected clips from the project

described below), the Fig. 3 display specifies a video program including a cross dissolve transition from clip 62 to clip 63, beginning at the "In" point of icon 65 and ending at the "Out" point of icon 65.

Figure 3 also shows a "push" special effect transition icon 66 in track FX, in alignment with overlapping portions of video clip 64 (in track A) and still image clip 63 (in track B). Because icon 66 represents a push transition (to be described below), the Fig. 3 display specifies a video program including a "push" transition from clip 63 to clip 64, beginning at the "In" point of icon 66 and ending at the "Out" point of icon 66.

Figure 3 also shows audio clip 67 in audio track A', which represents a single-channel (monaural) audio soundtrack. Because the "In" point (left edge) of audio clip 67 is aligned with the "In" point of clip 63, the soundtrack for the program will commence simultaneously with the start of the cross-dissolve from clip 62 to clip 63, and the soundtrack will continue during display of clips 63 and 64. Optionally, the user could add second and third audio clips to tracks B' and C' to specify a three-channel audio soundtrack (which might correspond to left and right stereo channels, and a "surround" or "sub-woofer" channel).

The system is programmed so that manipulation of audio level control icon 67A (displayed with clip 67 in track A') allows the user to adjust the level of the corresponding audio track, in the same way that sound is mixed in record and television production. With reference to Figs. 8 and 9, the user positions a pointer (cursor) 68 on middle line 69 of icon 67A (by manipulating mouse 38). The user then "clicks" mouse 38 (activates a control on mouse 38) to create a handle 71 (a black dot), and drags 71 handle up or down relative to line 69 to program the system to execute an audio clip fade in or fade out, respectively, and to deform a displayed "rubber-band" level control line 70. The default position of rubber-band line 70 is a position coincident with middle line 69, which represents a mid-range audio level for clip 67. Line 70 has "rubber-band" characteristics in the sense that, in response to a user's dragging of a handle 71 vertically at one position along time ruler 60, the system automatically deforms line 70 along part of its length in accordance with a model in which the portion of line 70 to the left of the handle simulates an elastic band (to provide for smooth temporal variations in audio level assigned to consecutive segments of audio clip 67). Thus, if the user drags a handle 71 downward from the position of pointer 68 in Fig. 9, the system automatically moves downward a portion of line 70 on the left side of pointer 68, as if that portion of line 70 were made of elastic material.

The user can create as many handles 71 as desired (three handles 71 are indicated in Fig. 9). Each ascending portion of line 70 represents a fade in, and each descending portion of trace 70 represents a fade out. In response to entry of a preview command, the system retrieves from storage the audio data for audio clip 67 and plays the audio clip through a speaker (such as speaker 39 of Fig. 1), with an instantaneous volume level determined by the position of line 70 relative to line 69 at the corresponding position along time ruler 60.

Next, with reference to Figs. 2, 10, and 11, another way will be described in which a user can control superimposition of overlapping video (or still frame image) clips displayed in the construction window. To accomplish this, the system is programmed to superimpose a clip displayed in the "Superimpose" track (identified by label "Super" in Figures 2, 10, and 11) with a clip displayed (along the same segment of time ruler 60) in track A or B, or with overlapping clips displayed in tracks A and B. When the system generates and previews the corresponding program, the images corresponding to the clips in tracks A or B (or both A and B) shows through transparent parts of the superimposed image.

To superimpose a video or still image clip (referred to as an "overlay" clip) with a clip (referred to as a "main" clip) displayed in track A, B, or both A and B, the user drags the overlay clip to the "Super" track, and aligns it with the relevant portion of the clip in track A. For example, Figures 10 and 11 show a main clip 70 in track A and an overlay clip 72 in a "Super" track. The construction window of Figs. 10 and 11 has been reconfigured to delete tracks B and FX. In a preferred embodiment, the user can reconfigure the construction window of Figs. 10 and 11 to add tracks B and FX of the type shown in Fig. 2.

The user specifies which portions of the overlay clip are transparent, in one of two ways. In one alternative, the user specifies a color (or range of colors) of the overlay clip as being transparent (so that the main clip will show through portions of the overlay clip having the specified color or range of colors). This can be done by displaying a transparency setting menu having icons which can be manipulated using mouse 38 to specify the "transparent" color or range. In another alternative, the overlay clip includes a special "alpha" channel, comprising bits which define a grey scale level for each pixel of each frame of the overlay clip. In this case, the system can be programmed to interpret the grey scale levels as degrees of transparency. An example of a clip having such an alpha channel is a clip consisting of 32-bit, still image frames generated by the "Photoshop" software commercially available from Adobe Systems Incorporated.

two new clips (which can be independently resized and repositioned along time ruler 60) by positioning a "razor blade" cursor at desired position along the time ruler and manipulating a control on mouse 38 to define this desired position as the "Out" point of the first new clip and the "In" point of the second new clip.

Microprocessor 31 is preferably programmed to enable a user to select a special effect transition icon, in the following manner, for display in the above-described "FX" track of the construction window. In response to a command from the user, microprocessor 31 causes a special effects menu (such as the menu shown in Fig. 12) to be displayed in a window on monitor 36. The special effects menu includes a set of transition icons, each which can be selected by positioning a cursor thereon using a mouse.

Each transition icon represents a different special effect transition between two clips: an "A" clip (displayed in track A of the construction window, and associated with an "A" image); and a "B" clip (displayed in track B of the construction window, and associated with a "B" image). The following fourteen transition icons are shown in Fig. 12 (more than or less than fourteen transition icons can be displayed in alternative embodiments of the invention):

a "Band Slide" icon, representing a transition in which the B image appears to slide over the A image in horizontal or vertical bars;

a "Band Wipe" icon, representing a transition in which the B image is revealed under the A image by horizontal or vertical bars;

a "Barn Doors" icon, representing a transition in which the B image is revealed under the A image from the center outwards;

a "Checkerboard" icon, representing a transition in which boxes wipe in a spiral to reveal image B under image A;

a "Cross Dissolve" icon (also shown within icon 65 in Fig. 3), representing a transition in which image A fades into image B;

a "Dither Dissolve" icon, representing a transition in which image A dissolves into image B;

a "Funnel" icon, representing a transition in which the A image is pulled through a funnel, revealing the B image;

an "Inset" icon, representing a transition in which a corner wipe reveals image B under image A;

an "Iris Round" icon, representing a transition in which a circular wipe opens to reveal image B under image A;

an "Iris Square" icon, representing a transition in which a rectangular wipe opens to reveal image B under image A;

a "Page Turn" icon, representing a transition in which image A curls to reveal image B underneath;

a "PICT Mask" icon, representing a transition in which a user selected 1-bit (black and white) image, of the conventional PICT type, and the system replaces the black in the PICT image with image A and the white in the PICT image with image B;

a "Push" icon, representing a transition in which image B appears to push aside image A; and

a "Radial Wipe" icon, representing a transition in which a line fixed at one corner of the screen sweeps across image A, revealing image B.

In response to a command from the user to activate the special effects menu, the system animates each of the transition icons displayed in the special effects menu. For example, Figure 13 is a set of six transition icon displays, representing the animated display of the "Push" transition icon of Fig. 12. The left-most image of Fig. 12 is displayed at a first time (t = 0), followed (in sequence) by the second image from the left, the third image from the left, the fourth image from the left, the fifth image from the left, and the right-most image. After the right-most image is displayed, the animation process repeats, and all six images are sequentially displayed again.

The user includes a special effect transition in the program being edited by selecting a corresponding transition icon from the special effects menu, and dragging the selected transition icon to a desired position along the FX track of the construction window. As described above with reference to Figure 3, the user adjusts "in" and "out" points of the transition icon in the FX track so that the left edge ("in" point) and right edge ("out" point) of the transition icon are aligned with beginning and end points of a selected overlapping portion of a first clip in track A and a second clip in track B (as transition icon 65 is configured in Fig. 3). In one class of embodiments, the user adjusts in and out points of each transition icon by positioning a cursor on the left or right edge of the icon, and dragging the edge relative to time ruler 60, in the same manner (described above with reference to Figs. 6 and 7) that a user adjusts "in" and "out" points of a video or still image clip in track A or track B.

In a class of preferred embodiments, each transition icon includes a set of control icons for setting parameters of the corresponding special effect transition (such as the in point, out point, and duration of the transition). Icon 90 of Fig. 15 is an example of a transition icon having such control icons.

In Fig. 15, the control icon displayed in area 80 determines the type of the special effect transition. The user determines the type of the transition by

Next, the caching steps (briefly described above) implemented by a preferred embodiment of the invention will be more fully described. Data are written into the cache memory (i.e., random access memory 32 of Fig. 15) in response to each user command for updating the construction window, or for previewing a program defined by a currently displayed construction window. An example of the latter type of command is a command to change the time scale of time ruler 60.

In response to each such command, the system calculates the addresses of the data that must be retrieved to update the construction window (or a preview window for previewing the program). The system then searches the cache memory to retrieve therefrom any of the required data currently stored in the cache memory. After retrieving any of the required data currently stored in the cache memory, the system retrieves from its mass storage memory (memory 33 of Fig. 1) the remaining required data. The system then caches all the retrieved data in the cache memory, processes the retrieved data in response to the command, and displays the processed data to update the screen display. As a result of the caching step, the system reduces the memory access time required for responding to future construction window updating or preview commands.

For example, in an embodiment of the invention, in response to a command for previewing a program, microprocessor 31 retrieves all frames of the program (from cache memory or mass storage memory), processes the retrieved frames in accordance with special effects transitions defined by transition icons currently positioned in the construction window (and in accordance with any user-specified filtering operation), and causes the processed frames to be sequentially displayed in a preview window on the screen of monitor 36. The system also caches the retrieved frames (in their unprocessed form).

In preferred embodiment, microprocessor 31 "compresses" each frame to be cached in memory 32, in the sense that it causes only some of the bits of the frame to be cached. For example, if a clip comprises 32-bit digital video data, including an eight-bit alpha channel for each frame of the clip, retrieved frames of the clip may be "compressed" by eliminating the alpha channel before caching the remaining 24-bit digital video data defining each frame. Such an alpha channel can be employed by microprocessor 31 to perform certain special effects processing (described above), and accordingly, such special effects processing must be performed on the retrieved frames before the frames are "compressed."

Various other modifications and alterations in the structure and method of operation of this invention will be apparent to those skilled in the art without departing from the scope and spirit of this invention. Although the invention has been described in connection with specific preferred embodiments, it should be understood that the invention as claimed should not be unduly limited to such specific embodiments.

Claims

1. A method for editing a video program including a sequence of clips and transitions between the clips, comprising the steps of:
   (a) displaying a time line;
   (b) generating a display representing the video program by simultaneously displaying representations of at least some of the clips, and transition icons representing the transitions between the displayed representations, in tracks along the time line; and
   (c) editing the video program by modifying the display.

2. The method of claim 1, wherein step (c) includes the step of:
   dynamically generating and displaying representations of the clips in response to commands for modifying the display.

3. The method of claim 2, wherein each of the displayed representations of the clips has a left edge aligned at an in point along the time line and a right edge aligned at an out point along the time line, and wherein step (c) includes the step of:
   changing an in point of a first one of the clips by changing the position along the time line of the left edge of the displayed representation of the first clip.

4. The method of claim 2, wherein each of the displayed representations of the clips has a left edge aligned at an in point along the time line and a right edge aligned at an out point along the time line, and wherein step (c) includes the step of:
   changing an out point of a first one of the clips by changing the position along the time line of the right edge of the displayed representation of the first clip.

5. The method of claim 1, wherein a first one of the transition icons is displayed in a special effects track, and has a left edge aligned at an in point along the time line and a right edge aligned at an out point along the time line, and wherein step (c) includes the step of:
   changing the in point of the first one of the

fects processing on a first clip and a second clip, said operation including the steps of:

filling an alpha channel of the first clip with a first value;

filling an alpha channel of a second clip with a second value;

performing a first special effect process in which selected data of the first clip are combined with selected data of the second clip to generate a processed clip having an alpha channel; and

processing data in the alpha channel of the processed clip to identify one or more edges of said processed clip.

19. The method of claim 18, wherein the first value is a hexadecimal 00 value, and wherein the second value is a hexadecimal 1F value.

20. An apparatus for editing a video program including a sequence of clips and transitions between the clips, comprising:

a display means;

a mass storage memory for storing the clips;

an input device;

a processing means coupled to the display means, the mass storage memory, and the input device, wherein the processing means is programmed with:

software for displaying a construction window on the display means, said construction window including a time line and a set of tracks extending along the time line,

software for retrieving selected ones of the clips from the mass storage memory and displaying representations of the retrieved clips in selected ones of the tracks at selected positions along the time line in response to commands received from the input device, and

software for displaying transition icons representing the transitions in selected ones of the tracks at selected positions along the time line in response to commands received from the input device.

21. The apparatus of claim 20, wherein the processing means is also programmed with software for sequentially displaying the video program in response to a preview command received from the input device.

22. The apparatus of claim 21, wherein the processing means is also programmed with software for editing the video program in response to commands received from the input device for manipulating the displayed representations of the retrieved clips and the transition icons.

23. The apparatus of claim 20, also including a cache memory coupled to the processing means, and wherein the processing means is programmed with:

software for identifying data needed to modify the construction window display in response to a display modification command from the input device, retrieving from the cache memory at least a first portion of the data currently stored in the cache memory and then retrieving any remaining portion of the data from the mass storage memory, then processing the retrieved data to generate processed data for modifying the construction window display in response to the display modification command, and caching the retrieved data in the cache memory.

24. An apparatus for editing a video program including a sequence of clips and transitions between the clips, comprising:

a monitor;

a mass storage memory;

a processing means coupled to the monitor and the mass storage memory, wherein the processing means is programmed with:

software for displaying a time line,

software for generating a display representing the video program on the monitor, said display including simultaneously displayed representations of at least some of the clips, and transition icons representing the transitions, in tracks along the time line, and

software for editing the video program by modifying the display.

25. The apparatus of claim 24, also including:

an input device coupled to the processing means,

and wherein the processing means is programmed with software for dynamically generating and displaying new representations of the clips in response to commands from the input device for modifying the display.

26. The apparatus of claim 25, wherein each of the displayed representations of the clips has a left edge aligned at an in point along the time line and a right edge aligned at an out point along the time line, and wherein the processing means is programmed to change an in point of a first one of the clips by changing the position along the time line of the left edge of the displayed representation of the first clip.

27. The apparatus of claim 25, wherein each of the displayed representations of the clips has a left edge aligned at an in point along the time line

the temporally varying filter.

39. The apparatus of claim 37, wherein the temporally varying filter is a mosaic filter, and the parameters include a start level and a final level for the mosaic filter.

40. The apparatus of claim 24, wherein the processing means is programmed with software for performing special effects processing operation on a first clip and a second clip, said operation including the steps of:

filling an alpha channel of the first clip with a first value;

filling an alpha channel of a second clip with a second value;

performing a first special effect process in which selected data of the first clip are combined with selected data of the second clip to generate a processed clip having an alpha channel; and

processing data in the alpha channel of the processed clip to identify one or more edges of said processed clip.

41. The apparatus of claim 40, wherein the first value is a hexadecimal 00 value, and wherein the second value is a hexadecimal 1F value.

FIG. 2

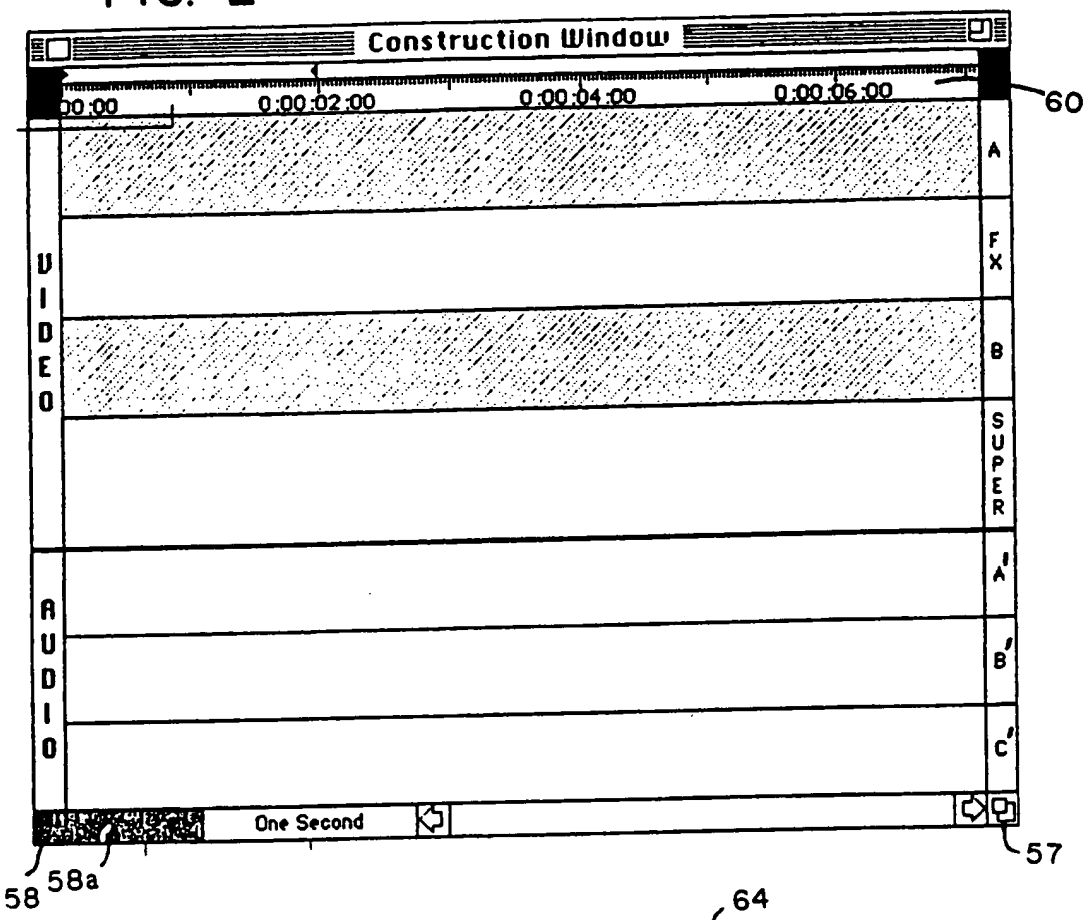

Construction Window
0:00:00
0:00:02:00
0:00:04:00
0:00:06:00
60
VIDEO
A
FX
B
SUPER
AUDIO
A'
B'
C'
One Second
57
58
58a

FIG. 3

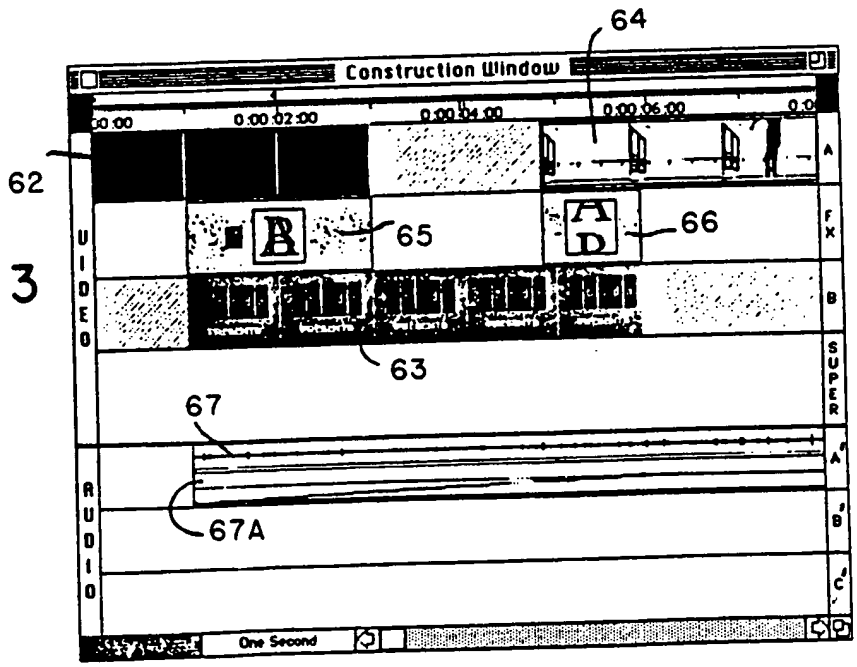

64
Construction Window
0:00:02:00
0:00:04:00
0:00:06:00
62
VIDEO
A
FX
B
SUPER
AUDIO
A'
B'
C'
65
66
63
67
67A
One Second

FIG. 10

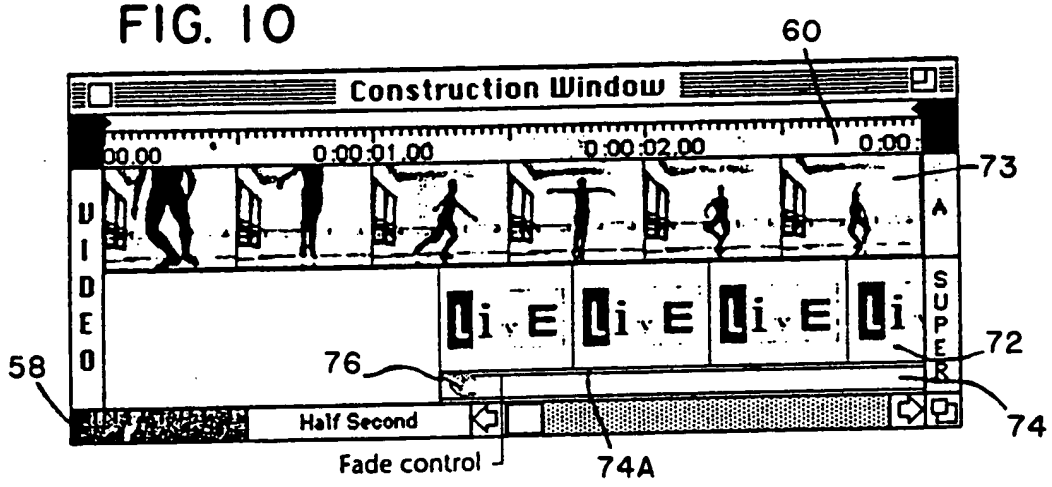


FIG. 11

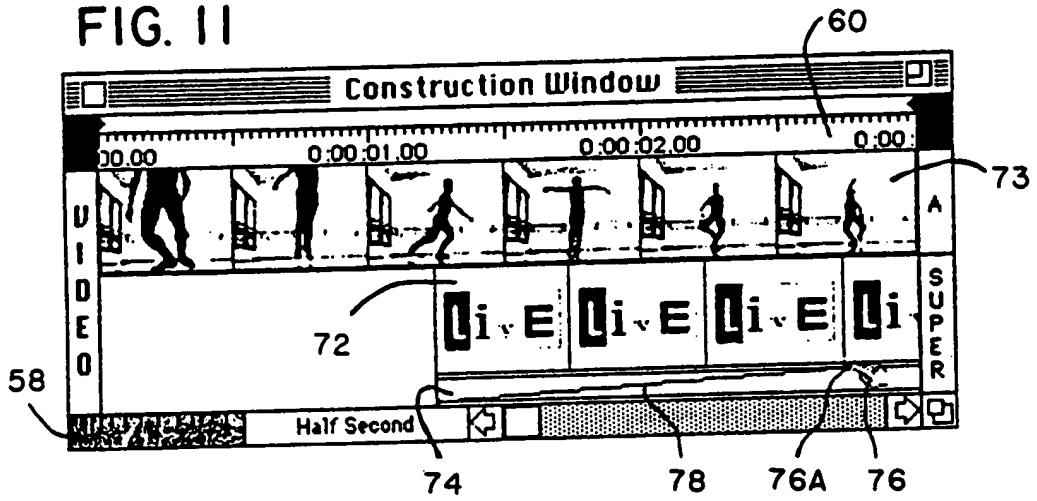


FIG. 14

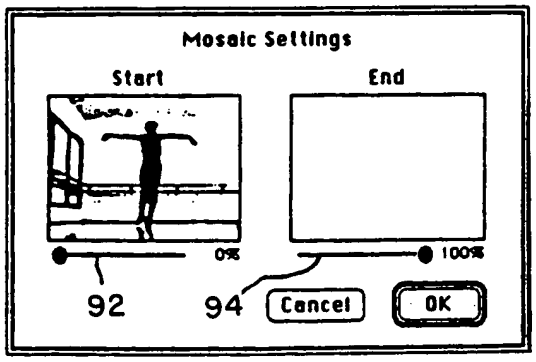
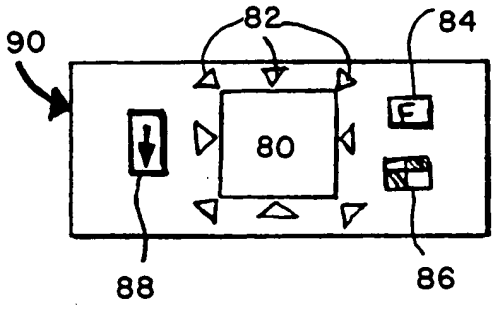


FIG. 15



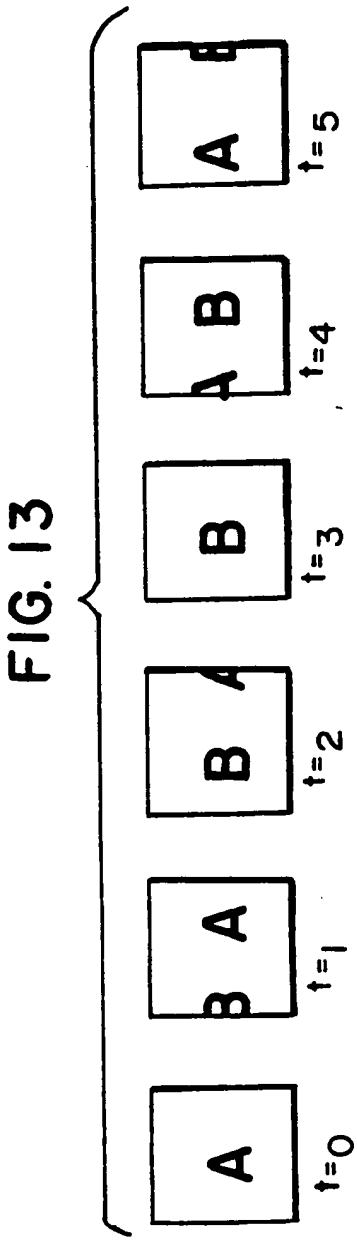


FIG. 13

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 93 30 2488

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	EP-A-0 469 850 (EPARD ET AL.) * the whole document *	1-4, 20-25	
A	FR-A-2 630 572 (DE LATOUR DEJEAN ET AL.) * the whole document *	1-4, 20-25	
A,D	EP-A-0 113 993 (MONTAGE COMPUTER CORPORATION) * page 27, line 1 - page 99, line 24 * & US-A-4538188	1-4, 20-25	
P,X	EP-A-0 526 064 (THE GRASS VALEY GROUP, INC.) * the whole document *	1-5, 20-24	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	27 JULY 1993	DAALMANS F.J.

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